Nota lepid. 9 (1-2) : 39-46 ; 31.III.1986 ISSN 0342-7536

Selection of roost sites by *Lasiommata megera* (L.) (Lepidoptera : Satyridae) on fencing at Brereton Heath Country Park, Cheshire, U.K.

Roger L. H. Dennis

The Manchester Grammar School, Manchester M13 OXT.

Abstract

Spatial variation in the distribution of adult *L. megera* on ranch fencing demonstrates that the butterfly actively selects for roost sites. Local climatic contrasts, in particular for sunshine, temperature and windspeeds, are implicated. It is suggested that the sites chosen allow the butterflies to remain active throughout the evening, thus enabling them to evade arthropod predators such as spiders more easily.

Résumé

La variation spatiale observée dans la distribution de *L. megera* L. (imago) sur les clôtures d'un ranch prouve que ce papillon choisit activement les emplacements où passer la nuit. Des contrastes locaux dans le climat, en particulier dans l'ensoleillement, la température et les vitesses du vent, jouent un rôle. On peut supposer que les emplacements choisis permettent à ces papillons de rester actifs pendant toute la soirée, et d'échapper ainsi plus facilement aux arthropodes prédateurs tels que les araignées.

Adult butterflies and their early stages are rarely, if ever, evenly distributed within habitats. A survey on *L. megera* at Brereton Heath from 1982 to 1984 has revealed distinctive egg-laying sites (Dennis, 1983) and different dispersion patterns for adult males and females (Dennis, 1982 ; Dennis & Bramley, 1985). The distribution of adults has also been shown to change significantly during the course of a single flight season. The butterfly, no doubt as others, is extremely sensitive to changing conditions. For instance, detailed mapping of territories shows these to change with different wind directions from day to day within very small areas (i.e., Fig. 1, the paddock entrance). Of course, there is every reason to suspect that butterflies are equally sensitive to conditions at potential roost sites, but it is usually difficult to trace sufficient individuals, particularly of temperate Satyrids, to test this. Towards dusk, *L. megera* occupies positions under leaves in hedgerows and

under the lower boughs of trees (Fig. 1, black square) and crevices in banks and walls. In each case few of the insects using these sites can be traced. However, the construction of ranch fencing at Brereton Heath in 1982 has provided an opportunity for new observations, as the butterfly not only uses the fencing as a cue for mate location (for 'perching' and as a flyway ; DENNIS, 1982) and oviposition (DENNIS, 1983) but also roosts under the rails. Much of the male population concentrates in the north west paddock, where conditions are most sheltered, sunny and warm and, as a result, as many as 40 individuals have been found on single evenings on the surrounding fence (maximum daily population recorded on the heath : 240 individuals).

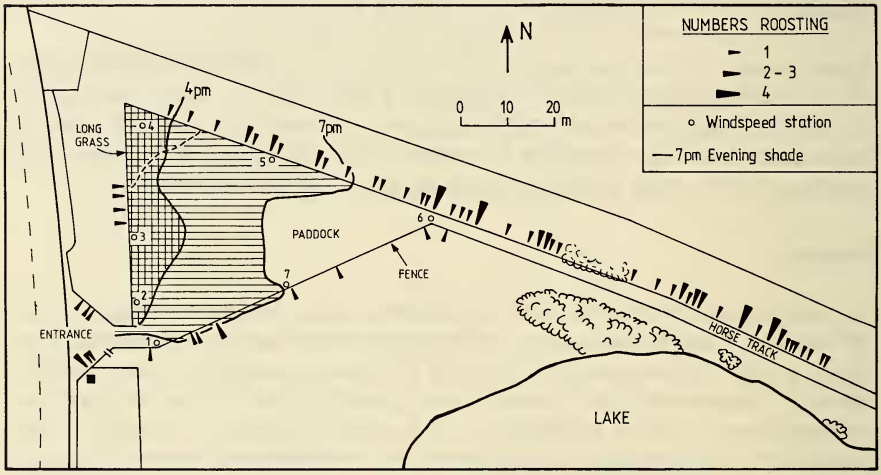

Fig. 1. Brereton Heath paddock and horse track, illustrating the numbers of *L. megera* roosting on the fences during five evenings in August 1984. Although the arrows pointing to the locations of *L. megera* are drawn, for convenience, on the outside of the fence (except at the paddock entrance), all the butterflies roost on the paddock side. The posts number to 131 and 102 on the north and south sides of the paddock/horse run respectively. Evening shade and windspeed stations are also shown. The black square gives the location of a *L. megera* going to roost under the bough of an oak on one of the five evenings.

In detail, this roosting habitat for *L. megera* at Brereton (see DENNIS and BRAMLEY, 1985, for full particulars of the study site) comprises a triangular paddock which opens to a road at the west end and extends eastwards as a horse run. It is bounded by ranch fencing, constructed of posts some 2 metres apart, linked with three sets of square-sawn rails (Fig. 3a, b). The rails are all nailed on facing the paddock and the horse track thus presenting, throughout the area, a uniform roost habitat for the insect (Fig. 4). Other

insects bask on the fence during the day, particularly Odonata and Diptera, but none of the other 14 or so butterfly species there do so, and only one *Aglais urticae* has been found roosting under the fence rails. Hunting and trapping spiders, however, frequent positions under the rails against the fence posts were *L. megera* roosts. The following data have been obtained during 5 days in August 1984, together with other records from the two previous years.

The majority of *L. megera* roosting on the fence are males (males : females, 5 : 1 ; N = 97), a much greater disparity between the sexes than is evident from population counts over the heath (MRR, males : females 1.6 : 1). Most of the butterflies roost directly under the rails against the posts, but occasionally some are found under the open rails where these are backed by shrubs. Occasionally, two or three are found together on one post under the same rail. Many more roost on the upper and mid rails (slightly more on the mid rail) than on the lower one regardless of the fact that the lower rail is more often protected by vegetation ($\chi^2_{(2)} = 19.4$; $p < 0.001$, based on exposed and 'available' roost sites). Individuals typically hang from the underside of the rail (90%, N = 87 ; Fig. 5), though some attach sideways on to the post (10%, N = 10).

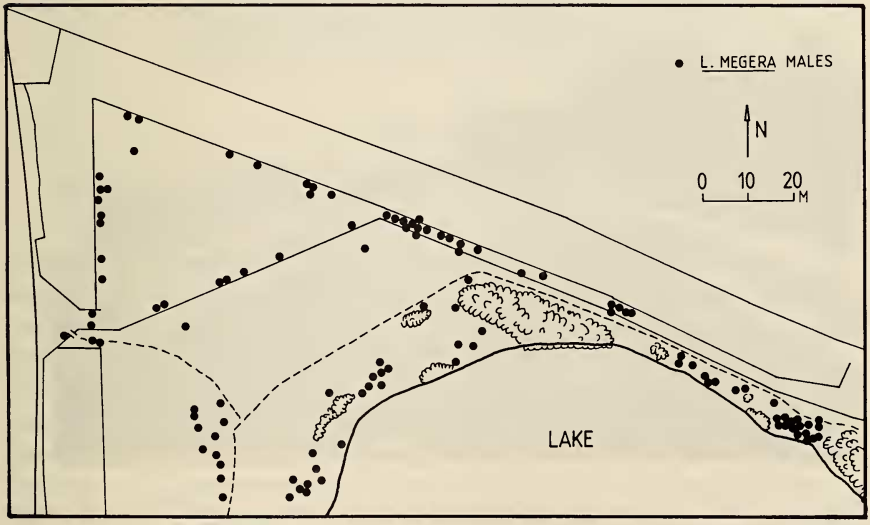

Fig. 2. The location of males recorded during nine hourly transects around the northern end of Brereton Heath on August 18, 1984.

a

b

Fig. 3. (a) TOP : Brereton Heath paddock looking westwards. (b) BOTTOM : The horse track looking eastwards out of the paddock.

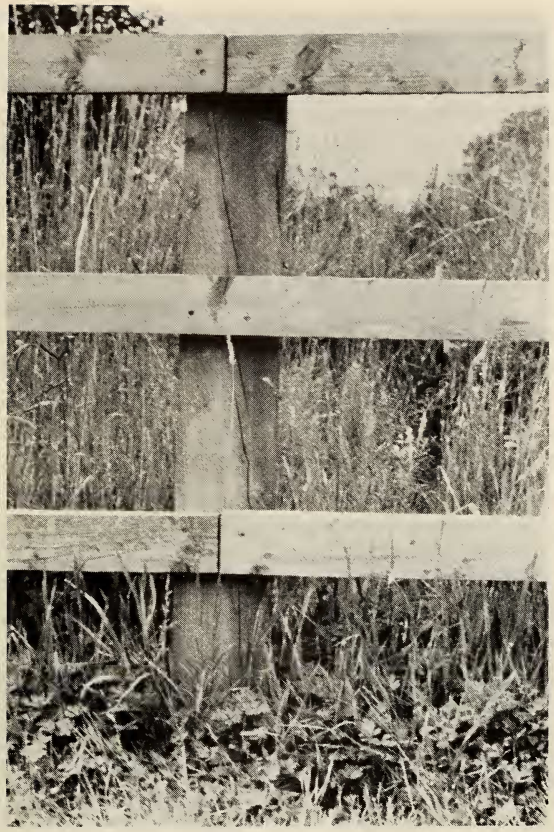

Fig. 4. A section of the square-sawn rail and post fencing at Brereton Heath used by *L. megera* for roosting.

There is a marked inequality in the distribution of roosting adults on the fencing. Apart from the paddock entrance, far more roost on the north side than on the west or south sides of the paddock. This difference is highly significant regardless of how the expected figures are calculated ($\chi^2_{(2)} = 8.6$; $p < 0.02$ on total number of posts ; $\chi^2_{(2)} = 11.4$; $p < 0.001$ on posts available, that is corrected for numbers of posts concealed by vegetation). When numbers that are found roosting around the paddock are compared with the location of *L. megera* recorded from hourly transects on any day (Fig. 2), there is still a highly significant bias for the north side ($\chi^2_{(2)} = 15.3$; $p < 0.001$). This distinction remains though is depressed rather when the 1984 roost sites are compared against daytime transect records for the whole

of the 1983 season ($\chi^2_{(2)} = 6.8$; $p < 0.05$). This confirms a deficit for the west side but not for the south fencing. There is some evidence that the south fencing improved as a roosting area in 1984, as winds were lighter and southerly and the grass south of the paddock was allowed to grow that summer thus giving more shelter. In previous years, invariably, there were more *L. megera* on the west than on the south fencing, but this is not a significant difference when compared with 1984 data (Fisher Exact Test, $p = 0.09$) ; more observations are needed to test this issue. However, the massive deficit for the south side of the horse run when compared to the north side ($\chi^2_{(1)} = 44.1$; $p < 0.001$) points clearly to advantages held by the north fence and the butterfly's sensitivity to this. Some difference seems also to occur between the north paddock fencing and the north side of the horse track based on the number of roost sites available ($\chi^2_{(1)} = 3.9$; $p < 0.05$) but this difference disappears when the numbers flying in both areas during the day are taken into consideration ($\chi^2_{(1)} = 0$; $p \simeq 1.0$).

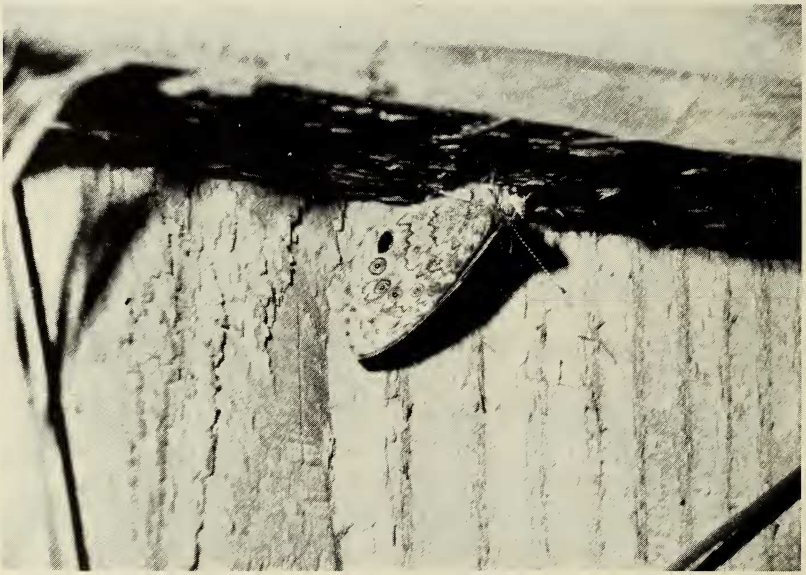

Fig. 5. A roosting marked male *L. megera*, well-camouflaged, hanging in a typical position on the underside of a rail in sunlight.

A number of possible reasons lie behind the biassed distribution of roosting adults on the paddock fencing. Although the number of roost sites (fence posts and rails) and the gross distribution of flying adults during the day fail to account for the pattern, it is still possible that the location of active adults

prior to roost time is important. Local climatic contrasts in the paddock are also clearly implicated. After 15.30 pm (BST), increasing amounts of shade cover the western end of the paddock and in relatively still conditions temperatures remain highest on the north east side of the paddock and along the northern fence of the horse run. The northern side of the horse run can be 2°C or more warmer than the south side of the horse run, which casts its own shade. Windspeeds have been taken with portable anemometers. The least windy areas, regardless of the direction of the wind, are sites 4, 5 and 6 (in that order) and the most windy sites are 1 and 7 (Fig. 1). In cloudy and wet conditions, typically associated with depressions and prevailing westerlies, the western end of the paddock is calmer and warmer. The exposed nature of the south fencing in these conditions is demonstrated by the way rain penetrates the cover under the rails.

Although the overall distribution of roosting adults is clearly biassed to the north fence, and excess numbers invariably roost on the north fence, the pattern of adults varies from day to day with the weather conditions. During the drought of 1984, when high sunshine levels occurred, temperatures remained high ($>$ 20°C) well into the evening and windspeeds were low ($<$ 5 metres/sec), many *L. megera* were active until after 19.00 pm (BST). Individuals stayed in the sun, basking and flying along the north fence in the eastern part of the paddock and along the horse run. As temperatures fell they flew rapidly to their roost sites often selecting them without much fuss, not on the shaded south side but on the sunny north side. Here they remained immobile but potentially active in the higher temperatures. Even to the gentlest of approaches they would drop from their roosts and fly away, – always an explosive exit. Later on in the evening, their response to contact depended much on ambient temperatures but evasion typically involved dropping from their perches. It is possible that the north side of the horse run may be chosen simply because the clefts under the rails there are nearer to the insects and more evident at the time they go to roost. But then, many *L. megera* pass close to the sites on the south fence when the decision to roost is made and sites against darker backgrounds have been seen to be selected on the west fence in previous years. It is perhaps more likely that there is an advantage to the butterflies remaining potentially active during the early part of roosting time and also in selecting locations where they are least likely to be blown-off when they are torpid during the night. The north fence has much greater shelter and lower windspeeds than the south fence. Numbers of large hunting spiders occur on the fences and these are probably more active themselves around dusk than later on or during cold nights. *L. megera* would also become more vulnerable to other ground-based predators if blown-off its perch on cold nights.

In cooler, cloudier conditions, *L. megera* roosts earlier. They have been seen to enter the paddock from the road and more take to the west fence (as in 1982) than on hot calm evenings. These insects are completely protected from the prevailing westerlies and their driving rainstorms. Yet, it is interesting how the butterfly does not adopt the greatest shelter under the lowest rail. There seems to be some well-established behaviour to roost some height off the ground, either away from a wider array of ground-based predators, cool evening or cold night temperatures or some combination of these factors. Escape from predators is perhaps also less easily achieved from the limited clearance of the lowest rail. All in all, these preliminary observations suggest that a degree of adaptive behaviour underlies the selection of roost sites by *L. megera.*

Acknowledgements

I would like to thank Matthew BRAMLEY and Margaret and Pamela DENNIS for helping with the fieldwork. I also extend my gratitude to Malcolm AINSWORTH, Brereton's Ranger, for kindly consenting to the survey being carried out in a restricted area and for numbering the fence posts for the survey.

References

DENNIS, R. L. H. 1982. Mate-location strategies in the Wall Brown butterfly, *Lasiommata megera* (L.) (Lepidoptera : Satyridae) : Wait or seek ? *Entomologist's Rec. J. Var.*, 94 : 209-214 ; 95 : 7-10.

DENNIS, R. L. H. 1983. Egg-laying cues in the Wall Brown butterfly, *Lasiommata megera* (L.) (Lepidoptera : Satyridae). *Entomologist's Gaz.*, 34 : 89-95.

DENNIS, R. L. H. & BRAMLEY, M. J. 1985. The influence of man and climate on dispersion patterns within a population of adult *Lasiommata megera* (L.) (Satyridae) at Brereton Heath, Cheshire (U.K.). *Nota Lepid.*, 8 : 309-324.